

# Clinical profile and prevalence of conjunctivitis in mild COVID-19 patients in a tertiary care COVID-19 hospital: A retrospective cross-sectional study

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**Purpose:** To find the clinical profile and prevalence of conjunctivitis and other ocular manifestations in mild COVID-19 positive patients in a nodal COVID-19 hospital. **Methods:** A retrospective cross-sectional, single-center study conducted in 127 mild cases of COVID-19 positive patients admitted between 27<sup>th</sup> March and 19<sup>th</sup> April 2020 in a tertiary care COVID-19 hospital in north India. From the hospital records, demographic data is collected. Ocular history and ocular examinations were done by face-to-face survey during ward rounds. **Results:** A total of 127 patients were included in the study with a median age of 38.8 years. Forty-eight (37.80%) patients had upper respiratory tract symptoms, 20 (15.75%) patients had systemic illness, 18 (14.17%) patients were using spectacles, and 50 (39.37%) patients had history of hand-eye contact. Out of 12 (9.45%) patients who had ocular complaints, 11 (8.66%) had ocular manifestation after admission. Among 11 patients, eight (6.29%) had conjunctival congestion. Three (3/8) patients had developed conjunctival congestion even before the manifestation of definite COVID-19 symptoms. Five patients (5/8) patients had no other associated ocular symptoms other than congestion. Six patients (6/8) had symptoms of upper respiratory tract infection. **Conclusion:** Mild conjunctivitis manifesting as conjunctival congestion is common and is one of the major ocular manifestations in COVID-19 positive patients even with milder disease.

**Key words:** Conjunctival congestion, COVID-19, prevalence

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is an enveloped, single-stranded RNA virus that causes coronavirus disease 2019 (COVID-19). It is highly transmissible through respiratory droplets produced by infected person and has a worrisome fatality of 2%–3%.<sup>[1]</sup> Symptoms can appear within 2–14 days of exposure.<sup>[2]</sup> The main symptoms of COVID-19 are fever, cough, fatigue, slight dyspnea, sore throat, headache, conjunctivitis, and gastrointestinal complaints. Complications in severe cases include pneumonia, renal failure, cardiomyopathy, encephalopathy, vasculopathy, and coagulopathy.

COVID-19 was first reported in China in December 2019 and now it is pandemic all over the world. Studies conducted in China showed conjunctivitis as one of the manifestations and the first case was reportedly notified by an ophthalmologist.<sup>[3-9]</sup> To the best of our knowledge, no studies are available in India to find the ocular symptoms among COVID-19 affected populations. This led us to conduct a study to find the prevalence of conjunctivitis and other ocular manifestation in one of the nodal hospitals for COVID-19 patients in India. This study may help us to understand the ocular symptoms associated with COVID-19 patients and guide us for taking appropriate measures while examining a patient with conjunctivitis in a current COVID-19 pandemic era.

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## Methods

The study was conducted in one of the tertiary COVID-19 care hospitals in north India. This was a retrospective cross-sectional observational study conducted in mild COVID-19 positive patients admitted between 27<sup>th</sup> March to 19<sup>th</sup> April 2020. Patients with fever, upper respiratory symptoms, or asymptomatic individual who were confirmed positive for COVID-19 by reverse transcription-polymerase chain reaction from nasopharyngeal swabs were included in the study. Diagnosis and classification of COVID-19 cases were done based on guidelines provided by Ministry of Health and Family Welfare, Directorate General of Health Services, India. The study was conducted in accordance with the ethical standard of the institutional research committee and adhered to the tenets set forth in the Helsinki declaration. Patients information were collected from the hospital record and the data were maintained in a predesigned proforma consisting of demographic details, exposure history, systemic symptoms, systemic illness, ocular symptoms, and ocular signs. Ocular history and examination had been done by an ophthalmologist posted in the ward wearing complete personal protective equipment using a

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torchlight, during the ward rounds by maintaining at least 1 m distance to avoid exposure of COVID-19 infection and the findings were recorded in the case notes. The details of the pattern of conjunctivitis were recorded mainly on the basis of presenting symptoms and torchlight examination findings. The data collected were entered into Microsoft Excel sheet and statistical analysis was performed using STATA ver. 12.1 (STATA Corp, College Station, Texas). Continuous variable age was presented as the median and range (min–max). Besides this, categorical variables were presented as frequency as well as in percentage. Categorical data were tested by applying Fisher's exact test. A *P* value of <0.05 was considered to be significant.

## Results

### Demographic data of patients

The demographic data and systemic history of the patients admitted on different dates were collected from hospital records. A total of 127 patients were included in this study. The median age of the patients was 38.8 years (range: 5–73 years); 113 (88.98%) patients were male and 14 (11.02%) were females. Majority (99 out of 127 patients) of them were recorded in the 3<sup>rd</sup> week of admission and few patients (13 patients in 1<sup>st</sup> week and 15 patients in 2<sup>nd</sup> week) were in the initial 2 weeks. Most of the patients admitted were from a religious gathering in New Delhi (102 patients: 80.31%). Many were screened for COVID-19 at an asymptomatic stage because of high-risk contact history. Thirteen patients (10.24%) had a contact from positive nonfamily member, six patients (4.72%) had contact from positive family members, one patient had history of international travel (London) and five patients (3.94%) had no known contact history.

### Data regarding systemic history

History recorded regarding systemic symptoms of COVID-19 was noted to document the manifestation of COVID-19 and its association with ocular symptoms. 79 (62.20%) patients had no systemic symptoms, 40 (31.49%) patients had cough, 10 (7.87%) had sore throat, and 6 (4.72%) had fever. Information regarding other systemic illness of these patients was collected for its association with ocular symptoms. 107 patients (84.25%) had no systemic illness, 11 patients (8.66%) had diabetes mellitus, eight (6.29%) had hypertension, two patients had thyroid disorders, one patient had pulmonary tuberculosis, one patient had parkinsonism, one patient had bronchial asthma, and one patient with cardiovascular disorder.

### Data regarding ocular history

Out of 127 patients included in the study, 12 (9.45%) patients had ocular complaints [Table 1]. The total number of patients who met the criteria for ocular involvement associated with the COVID-19 disease spectrum are 11 out of 12 (excluding one patient who had history of cataract surgery 1 month back with a complaint of mild conjunctival congestion continuing since the surgery without exacerbation of symptoms after admission). Eight out of 11 patients had conjunctival congestion suggestive of conjunctivitis [Table 2] and remaining three patients had other ocular manifestation comprising ocular burning sensation in one patient, history of only watering from eyes in one patient, and one hordeolum externum in one patient [Table 3]. Six out of 11 patients developed ocular manifestation along with COVID-19-related

systemic symptoms while five (45.45%) out of 11 patients developed ocular manifestation before any COVID-19-related systemic symptoms. Data collected regarding onset of ocular manifestation and its association with the day of onset of COVID-19-related systemic symptoms were analyzed. Of these six cases, two (18.18%) patients had ocular manifestation during 1<sup>st</sup> week after onset of COVID-19-related systemic symptoms, one (9.09%) patient in 2<sup>nd</sup> week, two (18.18%) patients in 3<sup>rd</sup> week, and one (12.5%) patient developed before onset of systemic COVID-19 symptoms. Among the five systemically asymptomatic COVID-19 patients who developed ocular manifestation, four patients developed conjunctival congestion during 1<sup>st</sup> week of being detected and one patient during 3<sup>rd</sup> week. History regarding the risk factors for conjunctivitis such as hand hygiene, eye protection, past history of eye disease, and previous ocular surgery was collected. Eighteen patients (14.17%) were using spectacles. History regarding hand-eye contact was collected to find the awareness of hand hygiene practices among patients. Most (59.84%) of the patients gave history of no hand-eye contact, 51 patients (40.16%) had history of hand-eye contact among them 50 patients with sanitized hand and one patient gave history of hand-eye contact without washing hands. Two patients had history of cataract surgery and one patient had history of refractive (LASIK) surgery in the past, rest no patient had previous history of any eye diseases.

### Data regarding patients with conjunctival congestion suggestive of conjunctivitis

A detailed ocular history regarding the onset, duration and other associated ocular complaints were elicited in those eight (8/127) patients who had conjunctival congestion suggestive of conjunctivitis. History of onset of conjunctival congestion and its association with the day of onset of COVID-19-related systemic symptoms analyzed from the data collected [Table 2] revealed that two (25%) patients had developed the conjunctival congestion without COVID-19-related systemic symptoms while six (6/8) patients who developed conjunctival congestion also had COVID-19-related systemic symptoms. Of these six, one (12.5%) patient had conjunctival congestion before the onset of COVID-19 symptoms, two (25%) patients developed conjunctivitis during 1<sup>st</sup> week after onset of COVID-19-related systemic symptoms, one (12.5%) during 2<sup>nd</sup> week, and two (25%) patients in 3<sup>rd</sup> week. Further details regarding associated ocular complaints in these eight patients with history of conjunctival congestion revealed that five patients (62.5%) had only conjunctival congestion without any other ocular symptoms, while three patients had associated symptoms of watering and one of these three also developed periorbital rash and lid edema with itching and photophobia. No patients had reported any ocular pain or diminution of vision. No patient had history of periauricular or submandibular lymph node enlargement. From the data already collected regarding risk factors of conjunctivitis, it was found that among patients with conjunctival congestion two patients had diabetes, three patients had hand-eye contact, and two patients were using spectacles. Six patients (75%) had associated upper respiratory tract symptoms among them, five patients developed at the time of admission and one patient developed sore throat on 7<sup>th</sup> day after admission. Two (25%) patients had no systemic symptoms other than conjunctival congestion. On further

detailed ocular examination for patients with conjunctival congestion, seven patients had bilateral and one patient had unilateral conjunctival congestion. All patient had diffuse conjunctival congestion, no chemosis or discharge or visible corneal changes were noted.

## Discussion

In our study, 11 (8.66%) out of 127 had COVID-19-related ocular manifestation and prevalence of conjunctival congestion among mild COVID-19 positive patients is 6.29% (8 out of 127 patients). At the time of admission, none of the patients

had conjunctival congestion which may be because in our study, 80.31% of patients were from a religious gathering in New Delhi and, hence, due to contact history many were screened even before they developed any established COVID-19-related symptoms. Out of eight patients, two (25%) patients developed conjunctival congestion without any COVID-19-related systemic symptoms and one (12.5%) patient developed conjunctival congestion before the onset of COVID-19 symptoms. Five (62.5%) out of eight patients had only conjunctival congestion without any associated ocular complaints. Rest of the three patients had associated symptom of watering and one of them developed periorbital rash and lid edema. Therefore, it was quite evident that conjunctival congestion could be an early and initial manifestation of COVID-19 even before developing any systemic symptoms. There is no significant association between conjunctival congestion and risk factors like hand-eye contact, systemic illness, use of goggles/not [Table 4]. 48 out of 127 patients had upper respiratory tract symptoms. Six (12.5%) out of this, 48 patients (12.5%) developed conjunctival congestion,

**Table 1: Ocular symptoms of patients (12/127)**

Symptom	No of patients	Percentage
Conjunctival congestion	9	7.08
Burning sensation	1	0.79
Watering	1	0.79
Painful eyelid swelling	1	0.79

**Table 2: Characteristics of patients with conjunctival congestion**

Patient	1	2	3	4	5	6	7	8
Age (years)	24	51	61	61	27	29	24	52
Sex	Male	Male	Male	Male	Male	Male	Male	Male
Exposure history	Religious gathering	Religious gathering	Religious gathering	Religious gathering	Contact from positive nonfamily members	Religious gathering	Religious gathering	Religious gathering
Systemic symptoms	Cough	Fever and cough	Sore throat	Sore throat	Sore throat manifested on 7 <sup>th</sup> day	No	No	Cough and Rhinorrhea
Duration of systemic symptom at the time of admission	5 days	4 days	2 days	2 days	Asymptomatic on admission	Asymptomatic	Asymptomatic	2 days
Systemic illness	Nil	Nil	Nil	Diabetes	Nil	Nil	No	Diabetes and hypertension
Ocular complaints	H/O Conjunctival Congestion and watering for 2 days	H/O Conjunctival congestion for 2 days	RE conjunctival congestion	Conjunctival congestion	Conjunctival congestion, watering, and Itching, photophobia and periorbital rash	Conjunctival congestion	Conj. Redness on and off 2 weeks	Conj. Redness on and off and watering for 2 weeks
Day of manifestation of conjunctival congestion after admission	7 <sup>th</sup> day (1 <sup>st</sup> week)	2 <sup>nd</sup> day (1 <sup>st</sup> week)	19 <sup>th</sup> day (3 <sup>rd</sup> week)	18 <sup>th</sup> day (3 <sup>rd</sup> week)	5 <sup>th</sup> day (1 <sup>st</sup> week)	18 <sup>th</sup> day (3 <sup>rd</sup> week)	2 <sup>nd</sup> day (1 <sup>st</sup> week)	2 <sup>nd</sup> day (1 <sup>st</sup> week)
Manifestation of conjunctival congestion after onset of systemic symptoms	12 <sup>th</sup> day (2 <sup>nd</sup> week)	6 <sup>th</sup> day (1 <sup>st</sup> week)	21 <sup>st</sup> day (3 <sup>rd</sup> week)	20 <sup>th</sup> day (3 <sup>rd</sup> week)	-	-	-	4 <sup>th</sup> day (1 <sup>st</sup> week)
Hand eye contact	Yes	No	No	Yes	Yes	No	No	No
h/o use of goggles/ glasses	No	No	Yes	No	No	No	No	Yes
Examination								
Conjunctival congestion	No	No	Diffuse	Diffuse	Diffuse	Diffuse	No	No
Associated findings					Lid edema Periorbital rash			

**Table 3: Characteristics of patients with other ocular manifestations**

Patient	9	10	11
Age (years)	48	59	26
Sex	Female	Male	Male
Contact history	Contact from positive nonfamily member	Contact from positive Nonfamily member	Contact from positive nonfamily member
COVID-19-related systemic symptoms	No	No	No
Systemic illness	Hypertension, hypothyroidism	HTN	Nil
Ocular complaints	Burning sensation for 1 week	Watering for 10 days	Painful swelling in left lower eyelid for 2 days
Day of manifestation of ocular symptom after admission	2 <sup>nd</sup> day	2 <sup>nd</sup> day	7 <sup>th</sup> day
Hand-eye contact	No	Yes	No
H/O use of goggles	Yes	Yes	No

**Table 4: Percentage of patients who developed conjunctival congestion with various associations**

	Conjunctivitis		P
	Yes	No	
H/O Hand-eye contact			
Yes	3	47	>0.999
No	5	72	
Systemic illness			
Yes	2	18	0.611
No	6	101	
No use of eye goggles or glasses			
Yes	6	103	0.316
No	2	16	
Upper respiratory tract infection			
Yes	6	42	0.052*
No	2	77	

*P*<0.05 is considered as significant

which was statistically significant. Three-fourth of our patients with conjunctival congestion were seen among those patients who had associated respiratory tract symptoms. Most of the patients (59.84%) had no hand-eye contact and rest of the patients gave history of hand-eye contact after sanitizing hand. It shows that patients are aware of hand hygiene practices.

There are several limitations in our study which is a single-center study with relatively small sample size and includes only mild cases of COVID-19 positive illness. Data could not be collected from moderate and severely ill patients due to critical medical care priorities, difficulty in safe access, history taking, and ophthalmic examination of such cases. Diagnosis of conjunctivitis was done based on symptoms and torchlight examination findings due to unavailability of additional resources for detailed examination in the isolation-cum-treatment center. Conjunctival swabs to estimate SARS-Cov2 mRNA load nucleic acid were not done, and also there is a difference in day of examination of the patients which could have affected the results. Nevertheless, the study does provide a useful insight into the spectrum of ophthalmic

manifestations and is the first report of the clinical findings in our population.

Prevalence of conjunctival congestion in previous studies<sup>[3-9]</sup> [Table 5] conducted in China showed variable results of 0.81%, 3.33%, 4.68%, 31.57%, 1.1%, 3.57%. Our study shows a prevalence of 6.29%. The difference in prevalence might be due to difference in sample size between various studies, severity of COVID-19 cases (mild, moderate, severe) included in the study, population characteristics between China and India, awareness of people regarding ocular hygiene, differences in the day of examination of patients and due to lack of detailed ocular examination and investigation to confirm the SARS-Cov2 nucleic acid in conjunctival swab.

## Conclusion

Mild conjunctivitis manifesting as conjunctival congestion is common, with a prevalence of 6.29%. It is one of the major ocular manifestations in COVID-19 positive patients even with mild disease. In our study, three out of the eight patients who developed conjunctivitis had onset of ocular complaints even before the manifestation of definite COVID-19 symptoms at the time of study. Hence, one should have a high index of COVID-19 suspicion in all patients with conjunctivitis and need a thorough ocular examination to rule out other known easily identifiable causes of conjunctivitis such as bacterial, chlamydial, adenoviral, or microsporidial disease and extreme precautions must be exercised to minimize the risk of contracting the infection. A careful COVID-19-related history and symptoms should be asked and if the conjunctivitis is accompanied by any of the COVID-19 symptoms even if very mild, they should undergo COVID-19 testing. Therefore, ocular examination should be exercised with extreme precautions with the knowledge that conjunctivitis is a known association of COVID-19 symptoms and larger surveillance is required to confirm if it could be a primary manifestation.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

**Table 5: Comparison of prevalence of conjunctival congestion between various studies**

Study name	Month and year of publication	Sample size	Patients with conjunctival congestion	Patients with conjunctival swab positive	% patients with conjunctival congestion
Guan <i>et al.</i> <sup>[3]</sup> conducted a study to find the clinical characteristics of coronavirus 2019 disease in china.	Feb 2020	1099	9	Not done	0.81%
Xia <i>et al.</i> <sup>[4]</sup> conducted a study to evaluate coronavirus in tears and conjunctival secretions of patients with SARS-CoV-2 infection	Feb 2020	30	1	1	3.33%
Chen <i>et al.</i> <sup>[5]</sup> studied ocular manifestation and clinical characteristics of 534 cases of COVID-19 in China: A Cross-sectional study	March 2020	534	25	not done	4.68%
Wu <i>et al.</i> <sup>[6]</sup> studied characteristics of ocular findings of patients with COVID-19 in Hubei Province, China	March 2020	38	12*	2	31.57%
Loffredo <i>et al.</i> <sup>[7]</sup> did a meta-analysis: Conjunctivitis and COVID-19	April 2020	1167	-	-	1.1% (3% in severe, 0.7% in nonsevere)
Hong <i>et al.</i> <sup>[9]</sup> conducted a study to evaluate the ocular symptoms and tropism of SARS-CoV-2 in patients confirmed with COVID-19.	April 2020	56	2	1	3.57%

\*In study conducted by Wu *et al.*, among 12 patients with ocular symptoms suggestive of conjunctivitis, 10 patients (26.31%) had conjunctival congestion. The study included more severe cases of COVID-19 positives

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